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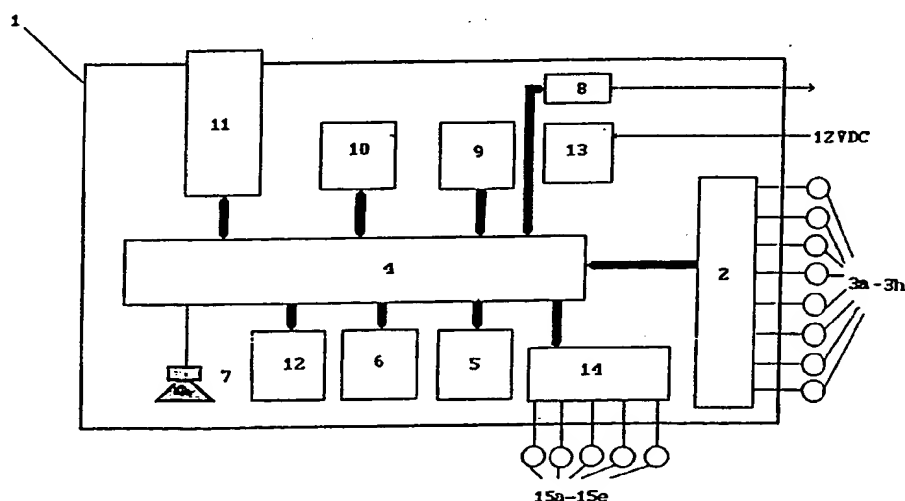
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(21) International Application Number: PCT/SE91/00540 (22) International Filing Date: 14 August 1991 (14.08.91) (30) Priority data: 9002650-1 15 August 1990 (15.08.90) SE (71) Applicant (for all designated States except US): SSES AB [SE/SE]; Box 42, S-642 00 Flen (SE). (72) Inventor; and (75) Inventor/Applicant (for US only) : ENHSSON, Björn [SE/ SE]; Mölnbovägen 15, S-153 00 Järna (SE). (74) Agent: ERIKSSON, Hans; Box 50, S-640 24 Sköldinge (SE).		(81) Designated States: AT (European patent), BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), NO, SE (European patent), US. Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>

(54) Title: METHOD AND APPARATUS TO ENHANCE TRAFFIC SAFETY



(57) Abstract

The present invention relates to a method and an apparatus to enhance traffic safety in driving a vehicle. The invention is characterized in that information regarding the behaviours of the driver and eventually the vehicle, e.g. movements of the accelerator and the steering wheel, continuously is fed to the memory of an IC-card/drivers licence connected or connectable to a microprocessor for an immediate or later comparing computing, whereby some behaviours can be recognized as being negative to traffic safety, which information directly or indirectly will be informed to the driver, and/or registered in the memory of the IC-card/drivers licence.

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METHOD AND APPARATUS TO ENHANCE TRAFFIC SAFETY

The present invention relates to a method and an apparatus to enhance traffic safety.

In the developed regions of the world the main part of the future efforts in short and mediate distance transport of people will with regard to resources probably be carried out by separately moveable and driven vehicles, each of which can take a limited number of passengers. The prognoses talks about more intensive traffic and an increased traffic volume, which will make a great demand upon the drivers.

From authorities there are two different and completely different ways to act to the combination driver/traffic. One way is the restrictive one, where rules and regulations strongly controls the traffic, and where there are no ways to perform an individual driving behaviour. The other way is based upon faith upon the driver's own judgement, and detailed rules and regulations are used with scantiness. Neither of these ways can be regarded as especially efficient when it comes to meet the challenges of the future. Thus the accidents have strongly increased in many countries in spite of tenacious use of rules and regulations together with heavy restrictions of the speed limits. At the same time as the traffic flow is choked resulting in stockings with standstill or very slow moving traffic, which naturally will cause an encreased stress on the environment by an increased exhaust discharge during part load and idling of the Otto and Diesel Engines, the effiience in the transport work will be disastrously low.

The opposite way of acting - with a minimal regulation of traffic and a handing over of the responsibility to each separate driver - is not used to its full extend anywhere in the world where a considerable transport work is to be done.

A minimal regulated traffic presume judicious drivers, i.e. drivers who have passed an extensive drivers education, not only concerning the actual skill to handle the vehicle, but which also is able to effect, develop and stimulate the whole social traffic behaviour of the driver.

The demanded minimal skill in different countries to allow persons to drive a car is varying, but is considered to be proportionately modest. Thus, also persons unfit to drive a vehicle can after an assiduously training learn some correct driving behaviours and in that way manage to pass a driving test. Often any personal or individual relations to driving doesn't exist under these circumstances. In not trained traffic situations the risk is impending that these drivers will act in an incorrect way or that they will panic.

Probably traffic accidents will never be totally avoided, no matter what technology is used in the future to enhance traffic safety. The human factor will probably influence car driving also in the 21:th century. A traffic system where the driver will hand over the driving to an superior central navigating system will hardly be of any bigger importance in the foreseeable future. On the the other hand, probably more and more technical assistance will assist the driver to make driving both more efficient and more safe.

Differnt technical aid to make driving more efficient, different navigating aid and extensive information systems continously providing information about traffic situations for the planned route can be mentioned as examples of technical aid making driving more efficient.

Often technical aid to enhance traffic safety are integrated in the vehicle. Much has already been done to make the vehicles safer and it seems as we now have reaced a situation where a continoued increased traffic safety probably can be achived in a more effecient way by paying attention to the driver and his tendencies to act incorrectly. If not, the

development of the technical aid will probably come to a total control of the vehicles, at the least in critical situations.

Most of the accidents occur in connection to situations where the driver acts in an incorrect way. This incorrect way of acting often results in that the driver brakes - the wheels will be blocked - the driver will not take his foot from the braking pedal and turn the steering wheel to pass the obstacle or avoid the ditch, - and thus the accident is actually happening.

That the consequences of accidents will be more serious at higher speeds is out of the question. This doesn't automatically mean that the main reason for the accident often is a too high speed, but this is just a contributing cause of the accident. Of course it is tempting to see the speed as the "most causing" accident factor as, in the extreme, no traffic accidents will occur if the speed limit is set to nil. Instead "the human factor" is often the preliminary cause to the accident, not only for the reason that the judgement of the driver has failed in the choice of speed, but an incorrect driving behavior of a fellow road user can also have consequences to the driver who drives at a higher speed, and which, indirectly by the higher speed, is the one who meet with the accident. Probably there are many drivers with maybe 50 years of "spotless driving" who, by an incorrect driving, still have caused several accidents to other fellow drivers. Thus it is anxious to find and correct the behaviors of these drivers.

One of the reasons to the negative development of accidents may probably be explained by the fact that the knowledge about drivers behaviour just prior to and in connection to an accident is far to meagre, which means that the development of accidents has not been forestalled by a suitable education and poised controlling. In narrow escapes and in traffic accidents the picture in the driver's mind of the sequences prior to, during and directly after the narrow escape or the accident

disappears. In many cases the traffic accident has to be reconstructed by an investigation at the place of the accident and by questioning survivors from and witnesses to the accident. By introducing ABS-brakes it is sometimes impossible to analyze skid tracks in connection to an accident. Thus in Germany attempts with a continuous recording of the driving and driver's behaviour have been initiated, which recording is repeated in shorter or longer intervals.

US-A-4.058.796 discloses a method to recognize the behaviour or the behaviour pattern of a driver. When this pattern differs from a normal pattern the driver can be informed about this difference. In this publication no possibility to continuously up-date the recorded pattern of behaviour by use of an IC-card is disclosed, which makes this method less suitable as an active support for a continuous supervision of and information to the driver.

The main object of the present invention is to obtain a more passive technique of information making it possible to supply the driver with adequate information about increasing traffic risks in good time based upon the drivers behaviour and/or other driving conditions, and which, to obtain an enhanced traffic safety, not is dependent that the technique is used in several, or all other vehicles and which continuously can be up-dated in connection to increased experience of the driver and/or increasing age and deteriorated ability to react and apprehend. The object of the invention is to obtain a technique which by informing the driver in one way decreases the risk that the wrong behaviour of the driver will come up at all, and, in the other way, if the incorrect behaviour in spite of this comes up registers this behaviour, and, at continued incorrect behaviour, compares and evaluates the risk of accidents for different combined incorrect behaviours and forward the conclusions into the IC-card/drivers license. At a convenient opportunity it will be able to perform a basis for giving the driver an individually

adapted and advanced training. According to the invention all this can be performed without interrupting the driver.

The object of the present invention is obtained by the method and the apparatus according to the characterizing clauses in the appendend claims.

By the invention a base and possibilities is obtained to a more individually adapted information regarding the risks and the risk situations a driver is just going to enter, and that this information can be given to the driver in good time prior to these situations actually happen. Thus, by the invention highly individual adapted aid (information) are given to the driver so that he understands the information as real aid and not primarily as unimportant information with a low degree of priority.

The invention creates an advanced driver's training and/or further education. At grave risky behaviours of the driver, there is accoring to the invention also a possiility to restrict, or to make the further drivning of the vehicle impossible.

By the invention a technique informing the driver about his ability to drive, at least in connection to annual safety inspections is obtained. In such an application information about each specific driver's normal behaviour is stored in an IC-card, e.g. the "patterns" regarding the movements of the steering wheel and the accelerator. In driving the behaviour of the driver is continously checked, and stored by and in the computer. These stored patterns of behaviour are compared with normal behaviours and in a great deviation the driver can be informed about his abnormal behaviour. If the driver, in spite of this information, continues to drive using the incorrect behaviour, and this behaviour, by the soft ware in the computer, is estimated to be dangerous above a certain acceptable level, the drivers possibilities to drive his

veichle can in different ways and to different degrees be influenced.

Another possibility with the technique according to the present invention is to "impose penalties" for grave incorrect driver's behaviour in such a way that in connection to said incorrect behaviour stored in the IC-card, information is also stored that a "fine fee" shall be paid within e.g. 30 days. In the most simple case the IC-card/driving license is also a paying card, which means that an automatic payment of the fine can take place at a suitable opportunity. In other circumstances a some more prolix procedure can be preferred, e.g. a personal appearence at a police station or at a driving school.

In its most simple embodiment the method and the apparatus according to the present invention stores and uses just information about the movements of the accelerator and the steering wheel. In a more advanced system also information about speed, clutch- and break-pedal, pressure on the break-pedal, engine speed, distance to approacing veichles in front and behind, operation of mid- and headlight, flashing direction indicators, use of radio and/or tape-recorder, a telephone, safetybelts, and perhaps information from gravity sensors indicating, on one hand, if the veichle is driven on gravel, asphalt, or on a rough road, and, on the other hand, is influenced from wind, information about the friction coefficient of the road surface (recieved by radio), pulse and breathing of the driver, etc.

Thus the invention can be dependent upon information coming from external conditions near the vehicle, both regarding stationary items and other traffic and/or, which gives a very satisfactory result accordning to the invention, just information regardning the vehicle and the behaviour of the vehicle and its driver.

In connection to the realization of the present invention it is necessary to perform an extensive collection, storing and computing of information from driving in different traffic situations to find and recognize "common denominators" of different driver's behaviours. Hence, it is of the same importance to get a "picture" of each driver's correct behaviour, as of his incorrect behaviour. In a first sequence it is advantageous to let different drivers drive certain road sections, e.g. on an enclosed ground, where they will meet different traffic situations and where the behaviours are registred, stored and compared and computed. Preliminary results from tests already done have shown that different groups of drivers in certain traffic situations behave incorrect in an entirely specific way, while other groups of drivers behave incorrect in some other way. One incorrect behaviour does not have to cause an accident, but when two drivers with incorrect driving behaviours are participating in the one and same traffic situation, the risk for a serious close escape, or an accident is drastically increased. This increased risk for an accident exists also when several incorrect behaviours occurs at the same time with the one and same driver. Thus, according to the invention it is possible to obtain a technique which will recognize such incorrect behaviours prior to these behaviours have led to any serious consequences, and inform about these behaviours to the driver in a non-disturbing way. Exactly how this shall be done is decided in connection to granting and to "updating" of the IC-card/drivers license, i.e. the card is used as a proof of competence. In some cases it is enough with discrete flashing lights on the dashboard, in other cases spoken information from loudspeakers is preferred, whereby the driver is adressed and where the information, e.g. a reminder of slippery roads, passing signs of speed limits, an attached trailer, a long uninterrupted travel, etc., quitely and undramatically can be transferred to the driver. At now reaction from the driver, the actual information can be given in a more obtrusive way and without being associated with the "information" from a "nagging wife".

According to the present invention a long term work for traffic safety can start with childrens in the age of 8 - 12 years by having these children drive small vehicles with good road manners on small winding training grounds, where the driving ability is on trail and developed. Information regarding the actual inborn driving behaviour is collected, stored and computed, and it is possible to find behaviours being characteristic to different ages, temperaments, sexes, etc. From the knowledge of the driver's behaviour in these ages, an individual adaption of each separate drivers education for the later real traffic environment is facilitated, at the same time as it is possible to stop the development of an asocial behaviour in connection to car driving at an early stage.

The invention will now be described in connection to a microprocessor-equipped unit built in in a vehicle, and for recieving and computing data regarding differnt behaviors of the vehicle and of the driver, and in which unit the IC-card/drivers licens with personal information is insertable, and which unit is programmed to inform the driver about personally adapted and relevant information.

In the drawing a unit 1 is shown, to which is connected different sensors 3a - 3f sensing the driving conditions, the driver's behaviour and any other driving conditons and behaviours being of importance to the driving and traffic safety. In the unit there is a central processor 4, the calculations and computing of which can be presented by a printer 5, a display 6 and/or by loudspeakers 7. It is also possible, via a serial interface 8, to connect the unit to a more powerful, e.g. stationary unit, e.g. for substituting the software of the unit; to control the driver's behaviour; etc. In the unit 1 activators 15a - 15d are included and which by an interface 14 can be connected to the instrumentation of the vehicle, and eventually to the controls of the vehicle, whereby an incorrect driver's behaviour can result in choking

the power output of the engine, i. . if the traffic conditions allows this, or, in som other way make it difficult for the driver to continue to drive with the risky behaviour. In such an situation it can, via the activators and the interface 14, be reasonable to connect special exterior warning indicators to make other trafficants aware of that they have to pay special attention to the driver in just this specific vehicle. A program memory 9 includes different program codes decided by the manufacturer. The computer memory 10 also includes information about the vehicle prestanda and it's normal road manners in different driving situations, while the external IC-card/drivers license 11 includes information about the driver and his normal behaviour, and is intended to collect and store information about the trips just this specific driver has made during a longer or shorter period of time. External IC-cards with a memory capacity being enough to store information about one year's driving of a normal driver, can advantagously be used. A key set 12 may be used to ask questions to the central unit, or to change the conditions for driving the vehicle, e.g. change of tires, attach of a trailer, when filling up petrol, loading, change of numbere of passengers, etc. In other connections the key set can be used for more active exchange of information, e.g. when a mobile telephone network is integrated to the unit.

Finally there is a part 13 inside the unit controlling and adapting the voltage from a 12 V DC power supply source.

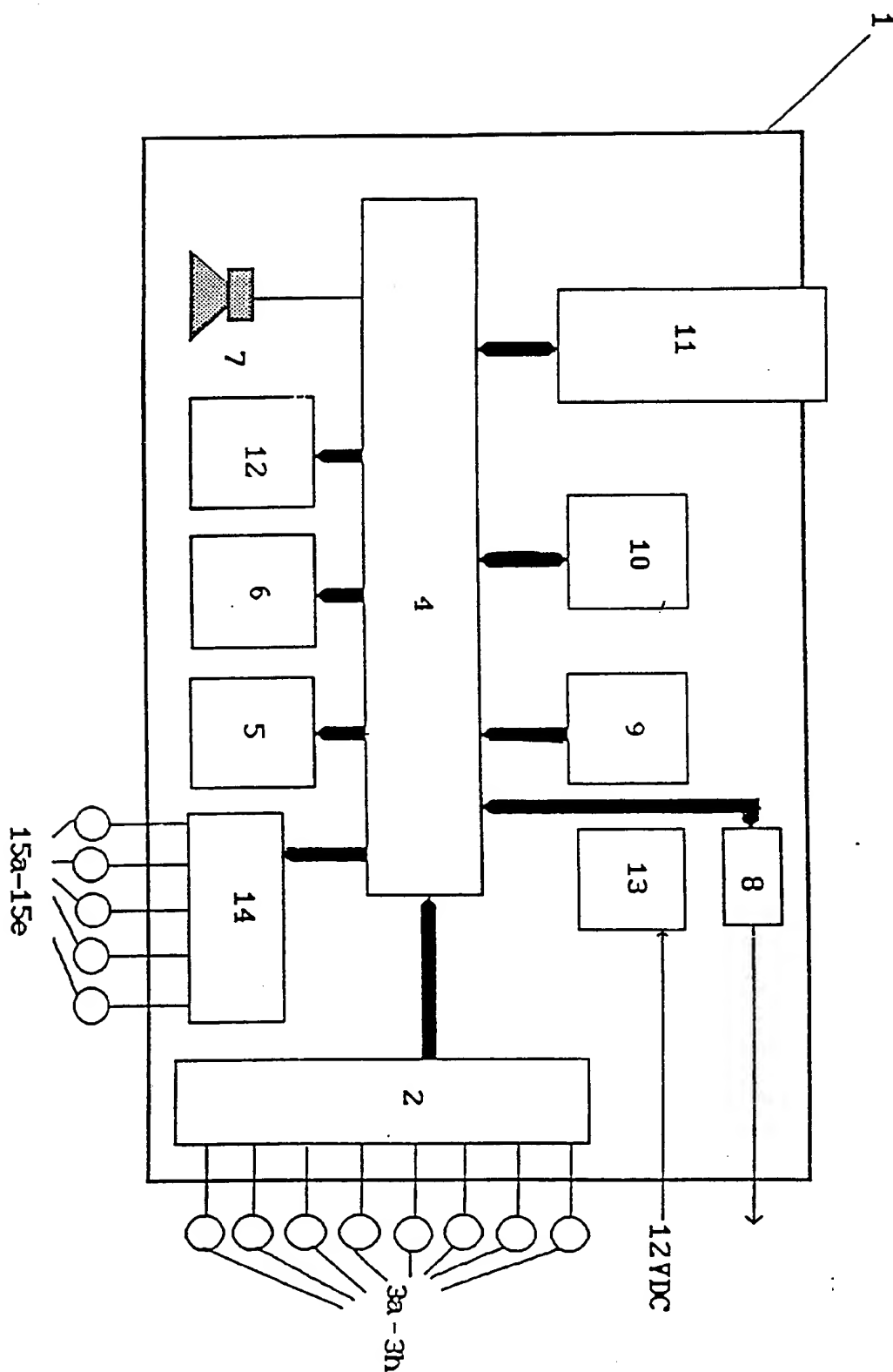
The invention is not restricted to the embodiments described above, but modifications can be done in the scoop of the following claims.

CLAIMS

1. Method to enhance the traffic safety in driving a vehicle, c h a r a c t e r i z e d i n that information regarding the behaviours of the driver, and eventually regarding the vehicle, e.g. movements of the accelerator and the steering wheel, is continously transferred to the memory of a IC-card/drivers license connected or connectable to a microprocessor for an immediate or later comparing computing, whereby some behaviours can be recognized as being negative to traffic safety, which information directly or indirectly will be informed to the driver and/or registred in the memory of the IC-card/drivers license.

2. Method according to claim 1, where a vehicle equipped with a memory connected or connectable to a microprocessor is driven on a special ground where different driving conditions, as slippery roads and wet road surfaces, rapidly can be produced, c h a r a c t e r i z e d i n that the driver's behaviour and his handling of the vehicle is registred and maybe compared with earlier drives, and/or with other drivers to determine the behaviours for which driving can be regarded as safe.

3. Apparatus to enhance traffic safety in driving a vehicle and to perform the method according to claim 1, c h a r a c t e r i z e d i n that in a vehicle-integrated unit (1) equipped with a microprocessor, a personal connectable and disconnectable IC-card/drivers license (11) with a huge memory capacity is arranged, and including and collecting, respectively, data regarding the driver, the driver's behaviour, other traffic, and eventually regarding the road character, and the behaviour of the vehicle, and that these data are computed with different softwares in the microprocessor (4), and wherein again some selected driver's behaviours are stored in the memory unit of the IC-card/drivers license (11) after being established by the microprocessor/software.



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 91/00540

I. CLASSIFICATION F SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: G 07 C 5/08, G 06 K 19/00, G 09 B 19/16														
II. FIELDS SEARCHED <div style="text-align: center; border: 1px solid black; padding: 2px;">Minimum Documentation Searched⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%; border: 1px solid black; padding: 2px;">Classification System</th> <th style="border: 1px solid black; padding: 2px;">Classification Symbols</th> </tr> <tr> <td style="border: 1px solid black; padding: 5px; vertical-align: top;">IPC5</td> <td style="border: 1px solid black; padding: 5px;">B 60 K, G 06 K, G 07 C, G 08 B, G 08 G, G 09 B</td> </tr> </table> <div style="text-align: center; border: 1px solid black; padding: 2px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸</div> <p style="padding: 5px;">SE,DK,FI,NO classes as above</p>			Classification System	Classification Symbols	IPC5	B 60 K, G 06 K, G 07 C, G 08 B, G 08 G, G 09 B								
Classification System	Classification Symbols													
IPC5	B 60 K, G 06 K, G 07 C, G 08 B, G 08 G, G 09 B													
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border: 1px solid black; padding: 2px;">Category *</th> <th style="border: 1px solid black; padding: 2px;">Citation of Document,¹¹ with indication, where appropriate, of the relevant passages¹²</th> <th style="width: 15%; border: 1px solid black; padding: 2px;">Relevant to Claim No.¹³</th> </tr> <tr> <td style="border: 1px solid black; text-align: center; vertical-align: top;">Y</td> <td style="border: 1px solid black; padding: 5px;">US, A, 4058796 (K OISHI ET AL) 15 November 1977, see column 11, line 27 - line 47; abstract; claims 1-4,13 ---</td> <td style="border: 1px solid black; text-align: center; vertical-align: top;">1-3</td> </tr> <tr> <td style="border: 1px solid black; text-align: center; vertical-align: top;">Y</td> <td style="border: 1px solid black; padding: 5px;">EO, A2, 0178439 (ANT NACHRICHTENTECHNIK GMBH) 23 April 1986, see page 3, line 3 - page 4, line 12 --</td> <td style="border: 1px solid black; text-align: center; vertical-align: top;">1-3</td> </tr> <tr> <td style="border: 1px solid black; text-align: center; vertical-align: top;">A</td> <td style="border: 1px solid black; padding: 5px;">FR, A1, 2637401 (SAVARD FRANCK JEAN) 6 April 1990, see claims 1-2,5 -----</td> <td style="border: 1px solid black; text-align: center; vertical-align: top;">1-3</td> </tr> </table>			Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	Y	US, A, 4058796 (K OISHI ET AL) 15 November 1977, see column 11, line 27 - line 47; abstract; claims 1-4,13 ---	1-3	Y	EO, A2, 0178439 (ANT NACHRICHTENTECHNIK GMBH) 23 April 1986, see page 3, line 3 - page 4, line 12 --	1-3	A	FR, A1, 2637401 (SAVARD FRANCK JEAN) 6 April 1990, see claims 1-2,5 -----	1-3
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents:¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>														
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border: 1px solid black; padding: 5px;"> Date of the Actual Completion of the International Search 13th November 1991 </td> <td style="width: 50%; border: 1px solid black; padding: 5px;"> Date of Mailing of this International Search Report 1991 -11- 15 </td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;"> International Searching Authority <div style="text-align: center; padding-top: 10px;">SWEDISH PATENT OFFICE</div> </td> <td style="border: 1px solid black; padding: 5px;"> Signature of Authorized Officer <div style="text-align: center; padding-top: 10px;"> AKE VÅNGBORG </div> </td> </tr> </table>			Date of the Actual Completion of the International Search 13th November 1991	Date of Mailing of this International Search Report 1991 -11- 15	International Searching Authority <div style="text-align: center; padding-top: 10px;">SWEDISH PATENT OFFICE</div>	Signature of Authorized Officer <div style="text-align: center; padding-top: 10px;"> AKE VÅNGBORG </div>								
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 91/00540**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on **91-09-27**.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4058796	77-11-15	DE-A-C- 2509354 JP-C- 1297217 JP-A- 50118427 JP-B- 60013853	75-09-11 86-01-20 75-09-17 85-04-10
EO-A2- 0178439	86-04-23	NONE	
FR-A1- 2637401	90-04-06	NONE	

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